Student directions *Curve Fitting* activity: How well does the curve describe the data?
  50 minutes untested
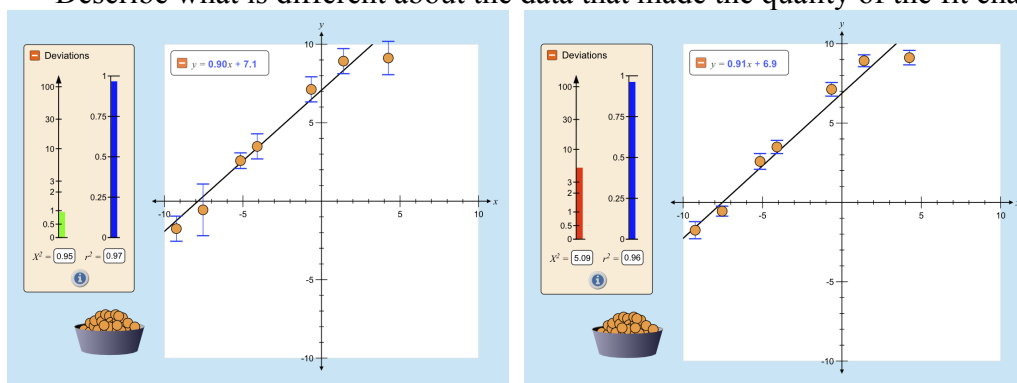
Learning Goals: Students will be able to:

- Explain how the range, uncertainty and number of data points affect correlation coefficient and Chi squared.

- Describe how correlation coefficient and chi squared can be used to indicate how well a curve describes the data relationship.

- Apply understanding of *Curve Fitting* to designing experiments
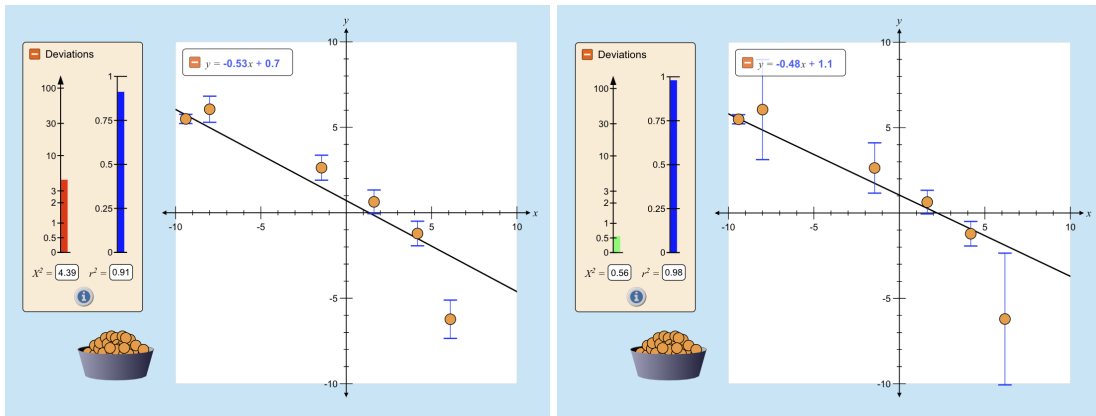
Directions:
Without changing any of the uncertainty bars, explore *Curve Fitting* to answer 1-4:

1. For each of the four types of curve fit, what is the minimum number of points to get a good correlation **and** a curve that demonstrates the known shape for the curve?

2. For each of the four types of curve fit, what is the minimum number of points to get in the green zone for χ^2 **and** a good correlation?

3. How can you desensitize the coefficient to variation in data? (In other words, if you collect data that would not fit on the line, under what conditions would r^2 stay nearly the same?) Is χ^2 desensitized the same way?

4. Summarize the relationship between the χ^2 red zone and the correlation coefficient. Include illustrations or screen captures to support your reasoning.

5. Explore how varying the uncertainty bars affects χ^2 and r^2 and then answer these questions.

   a. Two experiments were run and these graphs show the results. Which experiment has a curve fit that describes the relationship the best? What is your reasoning? Describe what is different about the data that made the quality of the fit change.
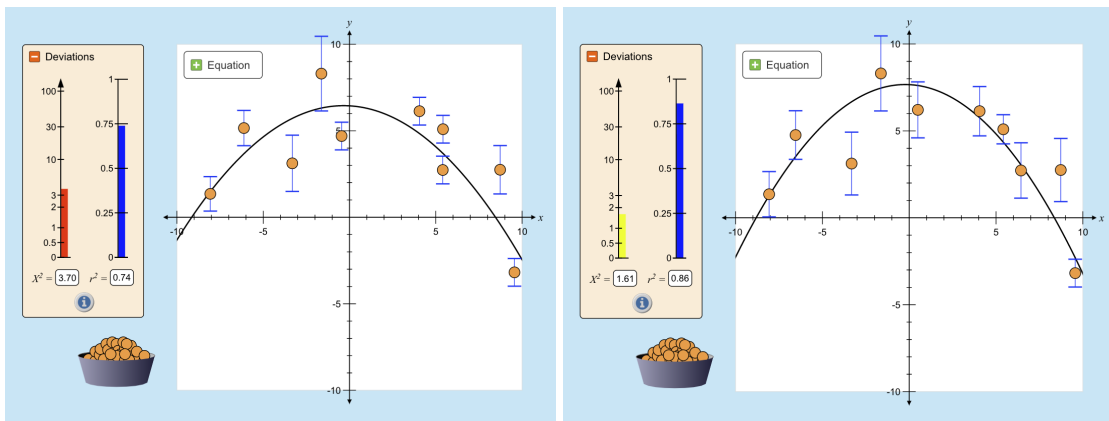
      b.   Which is best and why?

      c.   Which is best and why?

6. How does your understanding of χ^2 and r^2 help you with experimental design?